

# Instructions for Reviewers

Reviewer,

Thank you for taking the time to provide comments.

The first half of the document describes trout fisheries in Tennessee. This information was provided to help you understand challenges and opportunities associated with trout management.

The second half of the document is a draft management plan developed by TWRA staff. This draft plan generally reflects the current status and direction of the Agency regarding trout management. This is the part of the plan that needs your help. Are we headed in the right direction?

Tell us if you agree with the mission statement, goals, objectives, and strategies. Tell us which you support and which you do not support. What else should we be considering?

Please send comments by November 30, 2005. We are only accepting written comments. Send them to [Frank.Fiss@state.tn.us](mailto:Frank.Fiss@state.tn.us) or mail to:

Trout Plan  
Fisheries Division  
PO Box 40747  
Nashville, TN 37204

TWRA staff will use your comments to complete a Trout Management Plan for Tennessee.

Thanks for your help.

Sincerely,

Frank Fiss  
Stream Fisheries Coordinator  
Tennessee Wildlife Resources Agency

# First Draft for Review

## Trout Management Plan for Tennessee



Edited by

Frank C. Fiss  
James W. Habera

Tennessee Wildlife Resources Agency  
July 7, 2005



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## Foreword

The purpose of this plan is to identify the Tennessee Wildlife Resources Agency's (TWRA) goals, objectives, and strategies for the management of trout and the fisheries they provide in Tennessee. The plan will provide a foundation for annual recommendations to the Tennessee Wildlife Resources Commission and define realistic management goals given the availability of wild trout resources and hatchery trout production.

## Acknowledgements

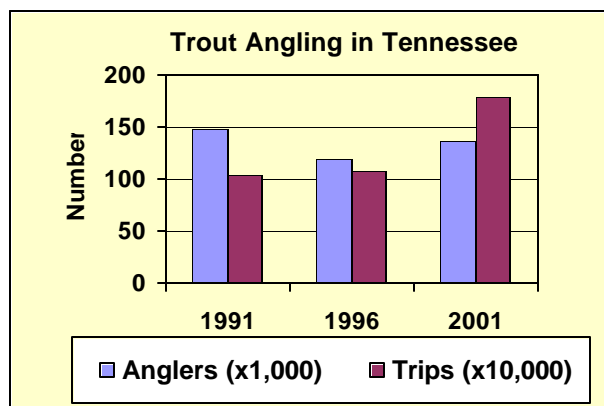
The draft goals outlined in this plan were developed by a TWRA committee of coldwater fishery specialists from across the state: Frank Fiss (Program Coordinator), Jim Habera (Wild Trout Biologist, Region 4), Travis Scott (Flintville Hatchery Manager, Region 2), Jack Swearengen (Fisheries Manager, Region 3), and Bobby Wilson (Assistant Chief of Fisheries). Additional comments were provided by other TWRA staff: Rick Bivens, Tim Broadbent, Bart Carter, Tim Churchill, Michael Clark, David Lane, Jim Negus, Dave Rizzuto, Danny Scott, and David Young.

We are currently asking Tennessee anglers to comment on the plan. Thanks in advance to all of you that take the time to comment. Your comments are needed to make this plan successful.

## Current Status

Before considering a plan for guiding future trout management, it will be helpful to review current information regarding Tennessee's trout anglers, the different trout programs available to them, and TWRA's trout fisheries management and hatchery resources. Management of Tennessee's trout fisheries is a multi-faceted process that seeks to provide a variety of experiences for many types of anglers.

### Trout Anglers

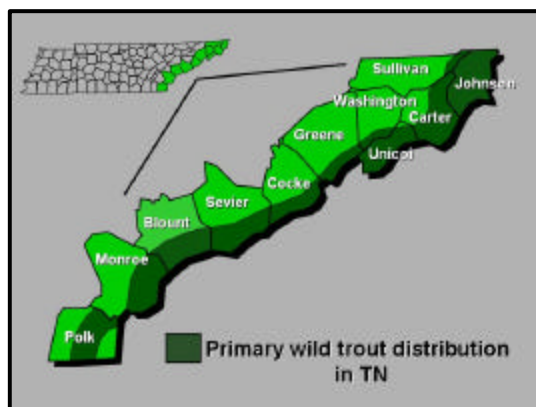


The U.S. Fish and Wildlife Service (USFWS) surveys anglers across the nation every five years to track trends in recreation. Based on surveys conducted in 1991, 1996, and 2001, an average of 135,000 resident and non-resident anglers fish for trout in Tennessee annually. They represent about 16% of all anglers. Trout anglers made 1.8 million trips in 2001. The estimated total expenditure associated with these trips was approximately \$77 million.

TWRA also collects information about resident anglers through telephone surveys conducted by the University of Tennessee. The most recent survey conducted in 2003 helps describe the typical trout angler. The average trout angler fished 9.4 times and average trip length was 4.7 hours. Only 10% of the anglers surveyed reported catching a brook trout (*Salvelinus fontinalis*), while 40% caught brown trout (*Salmo trutta*), and 83% reported catching rainbow trout (*Oncorhynchus mykiss*). On the average trip, five rainbow trout were caught and two were harvested. About 58% of trout anglers used bait, 61% used artificial lures, and 38% used flyfishing gear. Thirty-three percent used bait exclusively, and 15% always used flyfishing gear. Eighty percent of trout anglers were satisfied with TWRA's management of trout fisheries and 8% were somewhat to very dissatisfied.

Although it is easy to calculate statistics to describe the average trout angler, the results are often misleading because of the specialization among anglers. For example, some anglers never harvest fish, while others always harvest fish. An average of these behaviors would imply that the average angler harvests fish half of the time. This, however, does not accurately reflect the true behavior, as neither angler type is well represented. While TWRA does track the easily calculated averages, managers are aware of the wide variety of anglers that fish for trout.

### Wild Trout Streams



Tennessee is fortunate to have a relatively abundant wild trout resource. A wild trout can generally be defined as having spent its entire life cycle (egg through adult) in the wild. Populations of these fish are self-sustaining and require no stocking to survive. Because wild trout have specific habitat requirements (for water temperature, flow, spawning substrate, etc.), their distribution in Tennessee is primarily limited to the eastern part of the state (TWRA's Region IV), where they inhabit over 600

miles of coldwater streams in the Blue Ridge Mountains. About 70% of this wild trout habitat is located within the 625,000-acre Cherokee National Forest (CNF). The remainder occurs on privately owned lands and includes some of Tennessee's best wild trout streams. Additionally, the Tennessee portion of Great Smoky Mountains National Park (Blount, Sevier, and Cocke counties) contains another 245 miles of wild trout streams managed by the National Park Service. As recently as the early 1950s, several of Tennessee's larger coldwater streams including Beaverdam Creek, Doe Creek, and Tellico River had habitat limitations and few produced wild trout (Shields 1950, 1951). Today, these streams, along with many others, provide excellent wild trout fisheries.

Rainbow trout, brown trout, and brook trout comprise Tennessee's wild trout populations. Rainbow trout are the most abundant and widely distributed wild trout in Tennessee. Although native to Pacific drainages of the western U.S., rainbow trout became naturalized in many suitable Tennessee streams through the intensive stocking efforts that defined trout management during much of the twentieth century. Brown trout are native to Europe and Asia and, like rainbows, became naturalized in Tennessee through stocking. While not as widely



distributed as rainbow or brook trout, brown trout can live longer (up to 12 years) and attain larger sizes (up to 25 inches or more). They typically occur with rainbow trout, but are the predominant wild trout species in a few streams, such as Laurel Fork and Paint Creek in east Tennessee.



Brook trout are Tennessee's only native trout and once occurred at elevations as low as 1,600 ft. in some streams (King 1937). Habitat degradation (especially logging prior to the 1930s) and other land use changes, coupled with competition from introduced rainbow and brown trout, caused substantial brook trout distribution losses during much of the previous century (King 1937; Bivens et al. 1985). Consequently, they now inhabit about 150 miles in 107 streams and represent about

25% of Tennessee's wild trout resource outside the Great Smoky Mountains National Park. Despite widespread stocking of brook trout over the years, genetic analyses have shown that 53% of Tennessee's brook trout populations are of native, southern Appalachian heritage (Habera et al. 2001). The remaining populations are descended from hatchery-produced fish derived from northern brook trout stocks or consist of hybrids. Through the cooperation of TWRA, the U.S. Forest Service, Trout Unlimited and others, many of Tennessee's brook trout populations on the CNF were renovated or enhanced during the 1980s and 1990s by constructing barriers and removing non-native rainbow trout. Brook trout distribution losses related to rainbow trout encroachment appear to have stabilized for now (Strange and Habera 1998; Habera et al. 2001), thus there is currently less emphasis on controlling rainbow trout. However, brook trout populations are still subject to habitat degradation and other threats.

Tennessee's wild trout streams are quite pleasing aesthetically, but most have a limited capacity for producing trout. Their extremely soft waters lack dissolved minerals (alkalinity is usually  $\approx 20$  ppm as  $\text{CaCO}_3$ ) because of the underlying geology, causing them to be naturally infertile as well as poorly buffered against pH changes. Food is the primary limiting factor to trout populations in these streams, particularly during the summer months when trout metabolic rates are highest (Cada et al. 1987; Ensign et al. 1990). Consequently, Tennessee's wild trout are relatively small and short-lived (most do not exceed 10 inches or three years of age) and



average abundance is relatively low (28 lbs./acre; Habera et al. 2003). Wild trout populations throughout the southern Appalachian Mountains are similar (Habera and Strange 1993). Trout production, which is positively correlated with alkalinity (Kwak and Waters 1997), appears to increase in Tennessee streams where alkalinity exceeds 40 ppm, such as those influenced by springs. While the upper limit for wild trout abundance is approximately 100 lbs./acre in Tennessee, it can be several times higher in other regions where streams are naturally more productive (Platts and McHenry 1988; Behnke 1992). The abundance and size structure of wild trout populations in typical southern Appalachian streams can be substantially improved by supplemental feeding (Borawa et al. 1995), providing further evidence of the extent of food limitation.



Wild trout (especially native brook trout) are important ecologically and because of the fisheries management opportunities they offer. Wild trout populations reflect the quality and stability of the aquatic systems they inhabit, which are linked to the quality and stability of associated terrestrial systems. Recreational fishing for trout and salmon is extremely popular throughout the United States (Epifanio 2000) and wild trout support

much of this activity. In Tennessee, 44% of trout anglers have indicated that they fish for wild trout (Stephens et al. 1997). Accordingly, protecting and enhancing wild trout was ranked, in a recent survey of state fisheries agencies, as the most important issue addressed by their coldwater fisheries management plans (Born and Stairs 2003). Wild trout are an important component of TWRA's current strategic plan for managing Tennessee's streams and rivers and are particularly valuable as they expand the number and variety of trout fishing opportunities available to increasingly specialized anglers at very little cost. Most wild trout streams in Tennessee are currently managed with TWRA's statewide trout regulations: daily creel limit of seven fish, no gear restrictions, and a 6-inch size limit on brook trout. Special wild trout regulations with reduced creel and size limits were established on several streams in the late 1980s, but they function mainly to diversify angling experiences. Such regulations have little potential to effect wild trout populations given the biological limitations described previously and current levels of pressure and harvest (Habera et al. 2004). Tennessee's wild rainbow and brown trout fisheries in larger streams developed over the years from hatchery-supported fisheries. Stocking has continued in a number of these streams to meet angler expectations.

### Hatchery-Supported Streams and Small Lakes

Wild trout are generally limited to East Tennessee's mountain streams, but the demand for trout fishing is nearly statewide. For over 50 years, managers have addressed this need for additional trout fishing opportunities by stocking selected streams across the state. These hatchery-supported streams and lakes are primarily warmwater habitats that do not support trout year round. Some streams that support wild trout populations are also stocked with trout. These are typically waters with low productivity of wild trout or extremely high fishing pressure like Tellico River.



Approximately 310,000, 9- to 11-inch rainbow trout are stocked into 77 hatchery-supported streams and lakes in Tennessee annually. Stocking rates vary from 500 to 75,000 trout annually. Stocking rates are largely based on historical stocking rates that reflect the amount of access, anticipated fishing pressure, and availability of trout. Most trout are harvested within a few weeks after stocking. Most streams are stocked multiple times throughout the season to maintain better catch rates. Stocking frequency ranges from weekly to once a month, and the duration of the season largely depends on the temperature regime for individual streams. Most are stocked from March through June, while others can be stocked through September. These stocked waters provide trout fishing opportunities for many anglers that never get the chance to fish for wild trout. Because survival of stocked trout is usually limited by summer water temperatures, harvest of trout in these waters is generally encouraged. Regulations typically permit the harvest of seven trout per day with no size restrictions.

Many anglers observe that fishing is best right after TWRA stocks and want to know the stocking schedule. The stocking schedule is printed in the annual fishing guide and posted on the TWRA website to let anglers know approximately when the fish will be stocked. The location of hatchery-supported streams can also be viewed on maps provided at the TWRA website. The schedule lists the week that a particular location will be stocked and the hatchery has the option of stocking any day during that week. Although most anglers would prefer to know the actual stocking date, such forecasting would not give hatchery managers sufficient operational flexibility. Announcement of a set stocking date would also tend to attract too many anglers to a location, resulting in logistical problems for hatchery truck drivers and potential conflicts between landowners and anglers.

Many hatchery-supported streams are located on private property. Anglers are expected to obtain permission to fish and landowners are generally expected to grant permission. If



landowners routinely deny permission, then that location is removed from the stocking list. Lack of access is the typical reason for removing a stream from the stocking list.

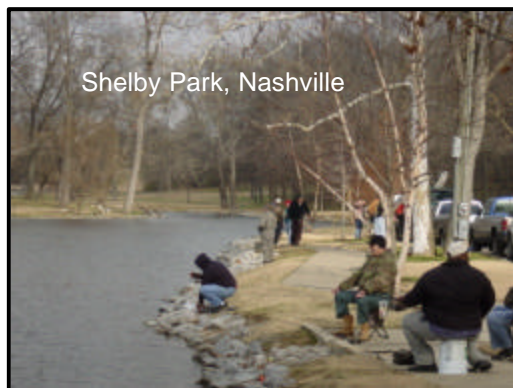
TWRA frequently receives requests to stock new waters, but these requests are rarely granted. TWRA biologists must determine that the risk of damaging native fauna by stocking trout is low relative to the benefits of establishing a new fishery. In some circumstances, an introduced population of wild trout could have irreversible effects on native aquatic fauna. Biologists must carefully evaluate each new location to make sure that there is little risk to native species. They must also determine that the fishery will benefit the public. Fisheries should be large enough to support a fishery and have adequate public access and parking.

TWRA funded two research projects on hatchery-supported streams in the 1990's. One study evaluated three streams (Mill Creek, Battle Creek, and Big Creek) and found that catch rates ranged from 1.0 to 1.9 fish/hour during the week following stocking and only 23% of the stocked trout were harvested (O'Bara and Eggleton 1995). They concluded that most of the unharvested fish go unused by anglers. Bates (1997) estimated that 95% of the trout stocked into Tellico River are harvested by anglers. Additional research to determine the minimum stocking rates that optimize angler satisfaction is warranted.

#### Delayed Harvest Program

Delayed harvest areas have become popular in several states and were first introduced in Tennessee in Gatlinburg during 1997. TWRA established delayed harvest areas in the Cherokee National Forest on Paint Creek and Tellico River in 2001. The goal of TWRA's delayed harvest program is to provide additional fall and winter fishing opportunities with relatively few hatchery trout. This is achieved by lightly stocking streams in October and allowing catch-and-release angling until March, when harvest is again permitted. Bait fishing is prohibited during the catch-and-release season to improve survival of released fish. The date the stream re-opens to harvest coincides with the traditional stocking season. TWRA has not yet evaluated these relatively new fisheries.

#### Winter Trout Program



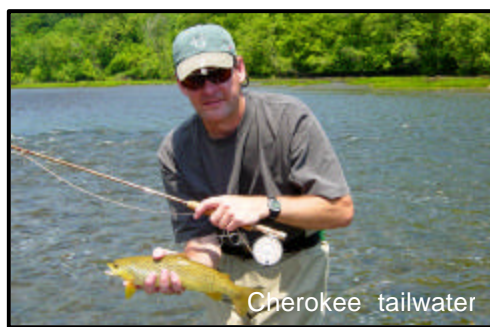
The winter trout program is also designed to provide angling opportunity during the winter months. Whereas the delayed harvest program is designed for more experienced anglers, the winter trout program is designed to recruit new anglers from urban areas. Winter trout events are typically located near town centers on public property with ample parking. Stocking dates are published well in advance of each event and higher stocking rates are used to assure high catch rates.

The winter trout program began in 1999 at J. Percy Priest Tailwater in Nashville. Initially, 14,000 9- to 10-inch rainbow trout were stocked monthly between December and March. This event's popularity was documented by a creel survey that estimated 779 trips during a 17-day period, and by a substantial increase in local trout license sales. Since 1999, the program has spread to 20 locations from Memphis to Chattanooga, with 67,000 trout stocked during the 2004/2005 season. The additional trout that permitted expansion of this program were provided by innovative production techniques at Flintville Hatchery and Dale Hollow National Fish Hatchery. This has become a popular program and TWRA receives requests to stock new locations annually. However, additional program growth is limited by hatchery production, which is now at capacity.

Stocking rates have never been evaluated for the winter trout program, so further expansion may be possible by changing stocking rates at existing locations. Given the high number of trout that the winter trout program could potentially require in future years, research is warranted to determine the minimum stocking rate that would still provide high catch rates for novice anglers.

### Tailwaters

Cold water released from hydropower dams operated by the Tennessee Valley Authority (TVA) and the U.S. Army Corps of Engineers (USACE) have extirpated fish populations that formerly occurred downstream. TWRA and USFWS stock trout below these dams to mitigate for the lost fisheries and TWRA is committed to creating quality trout fishing opportunities in these altered habitats.



TWRA manages 13 tailwaters located in middle and East Tennessee. All differ in water quality, instream habitat, and potential for trout production. Consequently, TWRA manages each tailwater differently with respect to stocking and fishing regulations. TWRA has written river-specific management plans for the Wilbur, South Holston, Norris, Center Hill, and Apalachia tailwaters (available

at TWRA's website) and will prepare written plans for the remaining tailwaters in the next few years. TWRA biologists survey most rivers annually to describe the abundance and size distribution of trout. Much of the funding for TWRA's fisheries research is committed to conducting angler surveys and trout research on tailwaters. All this information helps TWRA optimize stocking rates, evaluate proposed regulations, develop new management techniques, and ultimately improve the fisheries.

Creel surveys conducted since 1995 (e.g. Bettoli 1996a; Bettoli 2004) conservatively estimate that anglers make over 130,000 fishing trips to Tennessee tailwaters each year. Angler use varies annually at each tailwater and is primarily controlled by generation schedules. Lightly to moderately fished tailwaters (3,000 to 10,000 trips/year) include Dale Hollow, Normandy, and Tims Ford. Heavily fished tailwaters, such as Wilbur, Norris, South Holston, Apalachia, and Center Hill, typically support 20,000 to 25,000 trips per year. The average angler spends between \$29 and \$129 per trip depending on the tailwater. The total economic value of these eight tailwaters, estimated by adding trip expenditures to consumer surplus value, was \$8.8 million in 2001 (Williams and Bettoli 2003). This estimate was based heavily on travel costs and the top three tailwaters based on economic value were Center Hill, Hiwassee, and Dale Hollow.

Average catch rates over 0.7 fish/hour are generally considered representative of good fishing (McMichael and Kaya 1991; Wiley et al. 1993) and most of Tennessee's tailwaters exceed this standard. Creel surveys conducted since 2000 have reported catch rates varying from 0.6 to 2.6 trout/hour. Like most fisheries, relatively few anglers caught most of the fish. Most anglers caught few fish during a trip regardless of the tailwater. Depending on the tailwater, total catch during an average trip ranged from 2 to 10 trout, with harvest ranging from 0.2 to 3.0 trout per trip. Brown trout represented a small percentage (10-20%) of the trout caught.

Hutt and Bettoli (2003) recently studied the recreational preferences of tailwater anglers in Tennessee. These anglers fished 32 days per year and had nearly 16 years of experience fishing for trout. They were twice as likely to use bait (68%) compared to artificial lures and flies (32%). The study also identified five distinct groups of anglers that fish Tennessee tailwaters. These groups are defined by anglers whose experience varies from novice to expert and who may, or may not, harvest fish. Such diversity challenges TWRA to provide something for all types of tailwater trout anglers.

TWRA, in cooperation with Dale Hollow National Fish Hatchery, stocks approximately 1.5 million trout into tailwaters each year. Stocking rates, species and sizes vary among tailwaters, but all are stocked with 9-inch rainbow trout. Smaller trout (fingerlings) are also stocked where they are capable of growing to desirable sizes and account for over 600,000 of the trout stocked into tailwaters annually. The Norris, Wilbur, and South Holston tailwaters have particularly successful fingerling stocking programs. Brown trout are stocked into most tailwaters, although at much lower rates than rainbow trout. The Normandy, J. Percy Priest, and Ocoee tailwaters do not have cold water year-round and receive only 9-inch rainbow trout seasonally. The Wilbur tailwater has been stocked with brook trout since 2001 to develop a river fishery for this species that is normally found only in smaller streams at higher elevations.

Historically, many of Tennessee's tailwaters were limited by poor water quality and inadequate flows. Efforts in the past decade by TVA have greatly improved water quality below many of its dams (Scott et al. 1996), particularly South Holston, Cherokee, and Norris. Unfortunately the

USACE has yet to correct serious water quality issues below Center Hill and Dale Hollow dams. Poor water quality reduces trout growth and survival, making higher stocking rates necessary to maintain angler catch rates and limiting the potential for producing quality-sized fish.

Natural reproduction has been documented in the South Holston, Wilbur, and Norris tailwaters. Brown trout reproduction in the South Holston tailwater has been consistent and substantial in recent years. For this reason, TWRA stopped stocking brown trout into the South Holston tailwater in 2004 to create a unique wild trout fishery. The Wilbur tailwater is the second best producer of wild fish, followed by the Norris tailwater. Natural reproduction is too low in the Wilbur and Norris tailwaters to warrant reduced stocking rates.

TWRA uses a variety of fishing regulations to maintain and improve quality fishing in tailwaters. Most are under statewide regulations that include a seven trout creel limit with no size restrictions. Quality zones on the Wilbur and Apalachia tailwaters limit harvest to two trout over 14 inches and bait is prohibited. Quality zones were implemented to maintain high catch rates and improve fish size. The bait restriction reduces catch-and-release mortality and diversifies angling experiences. Seasonal closures of spawning areas and a 16 to 22-inch protected length range (PLR) on the South Holston tailwater were enacted to protect large spawning trout. More restrictive regulations for brown trout in the Apalachia (14-inch minimum, limit of two) and Center Hill (18-inch minimum, limit of two) tailwaters were recently established in an attempt to increase the abundance of quality trout.

### Reservoirs



Stocking trout in reservoirs helps diversify angling opportunities in these waters. Only reservoirs that have a year-round supply of well-oxygenated cold water can support trout fisheries. Tennessee has seven reservoirs that currently support trout fisheries: Dale Hollow, South Holston, Watauga, Fort Patrick Henry, Calderwood, Chilhowee, and Tellico (~60,000 acres total). Some reservoir trout attempt to spawn in tributaries, but these attempts

are largely unsuccessful and stocking is required to maintain reservoir fisheries. Trout are stocked during the winter to assure that surface water temperatures are cold enough for their survival. Approximately 190,000 9-inch rainbow trout are stocked into Tennessee reservoirs annually. Approximately 100,000 7-inch lake trout (*S. namaycush*) are produced for Watauga and Chilhowee reservoirs each year. Brown trout stocking was initiated in Dale Hollow and South Holston reservoirs during 2001 (20,000 trout/reservoir) to create new fisheries, but few anglers have reported catching any. The timing of brown trout production yields a 6-inch brown trout for winter stocking. These smaller trout may be more vulnerable to predation compared to the 9-inch rainbow trout that seem to have better survival.

Length restrictions cannot be used to manage reservoir trout fisheries during the summer because surface temperatures are too warm to successfully release fish. TWRA restricts harvest of trout during the winter on South Holston and Dale Hollow reservoirs to allow trout to grow larger before being harvested and to limit the harvest of freshly stocked fish. Most successful anglers catch trout in reservoirs by targeting them in the summer months when trout are limited to deep-water habitat. Anglers commonly troll lures with downriggers or fish bait suspended in deep water. Catch rates are typically low on reservoirs ( $< 0.25$  trout per hour, Bettoli 1996b; Malvestuto and Black 2003), although Calderwood produced catch rates of up to 0.6 trout per hour in 1999 (Yow et al. 2002).

Compared to other reservoir fisheries, very little is known about trout in Tennessee's reservoirs. Where creel surveys have been conducted, the number of fish harvested was typically very low ( $<10\%$ ) relative to the number stocked. Despite such low return rates and relatively low use by anglers, TWRA managers have continued to support a reservoir trout program because of its potential to provide unique fisheries that could possibly be enhanced if more information were available.

#### Private Trout Fisheries

Private trout fisheries are ponds or streams where all access is privately controlled and landowners charge a fee to fish. Some operations use feeding stations to keep fish from leaving the area and to produce larger trout. Some rely on wild trout and others stock trout to sustain populations. Currently, there are only a few private trout fisheries in Tennessee. TWRA's angler recognition program has documented that some of these streams routinely produce trophy trout.

Privately-managed trout waters have the potential to provide unique fishing opportunities for anglers that are willing to pay for the experience, but there are risks. The primary concern is that a potentially harmful species of fish would be introduced, or that a disease, parasite or some other exotic organism could be released with the trout. The spread of exotic species is a major threat to aquatic ecosystems (Simon and Townsend 2003; Dunham et al. 2004). TWRA uses disease-free eggs and monitors its hatchery for pathogens regularly to reduce this risk. Currently, it is illegal to stock streams without TWRA's permission. Landowners who want to establish hatchery-supported private fisheries must obtain permission from TWRA to release fish. TWRA rarely grants permission because the risk of harmful introductions is high relative to the potential public benefit.

As private trout fisheries become more commonplace, a market for fishing opportunity will be established (much as it has for deer hunting opportunity). Once a price is set, other landowners may be less willing to allow "free" fishing on their land. This could impact many anglers because nearly all trout fishing outside the National Forest occurs on private land. However,



such a scenario may cause landowners to value their stream aquatic resources more, making them stronger advocates for healthy streams.

#### TWRA Trout Management Personnel

License fees and Tennessee's share of federal funding pay for trout management, research, stocking, and enforcement of fishing and water quality regulations. The budget for TWRA's trout management program is approximately \$1.5 million annually. There are 3 to 4 stream management positions in each of TWRA's four regions and a program coordinator in the Fisheries Management Division (Nashville). All 14 positions of this management team split their time among multiple TWRA programs, but primarily work with the trout and warmwater stream programs. The resources dedicated to trout management vary from region to region in proportion to the number of trout fisheries being managed. Because producing and stocking fish are integral parts of TWRA's trout management efforts, trout fisheries currently consume, mile for mile, more agency resources than typical stream bass fisheries.

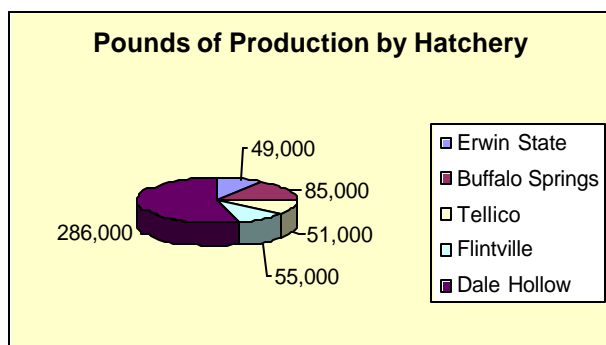


Electrofishing North River

The trout management team in each region is responsible for monitoring trout populations and habitat, recommending regulations and stocking rates, and communicating with anglers to stay informed of local issues. The regional trout management teams are the local experts. The trout program coordinator provides guidance and support for the regional teams, directs research, prepares strategic plans and reports, and maintains databases on fisheries statewide.

County Wildlife Officers schedule a portion of their time to enforce trout fishing regulations and water safety. When warranted, several officers may cooperate to perform special details designed to increase compliance. These operations are often covert and not visible to the public. Trout anglers highly value enforcement activity, and TWRA frequently receives requests for additional enforcement on trout streams (especially hatchery-supported streams and tailwaters). Officers play an important role in communication between anglers and TWRA. In addition, some officers help stock trout and monitor trout populations.

## Trout Hatcheries



TWRA operates four trout hatcheries: Erwin State Hatchery, Tellico Hatchery, Buffalo Springs Hatchery, and Flintville Hatchery. These hatcheries produced approximately 240,000 pounds of trout (884,000 trout) at a cost of about \$860,000 in 2004. An additional 1.2 million trout were produced by Dale Hollow National Fish Hatchery (DHNFH), which is operated by the USFWS. The Erwin

National Fish hatchery also stocks about 10,000 pounds of large brood fish (12-18 inches) annually. Two TWRA warmwater hatcheries (Eagle Bend and Normandy) also play a minor role in annual trout production (<1,000 pounds).

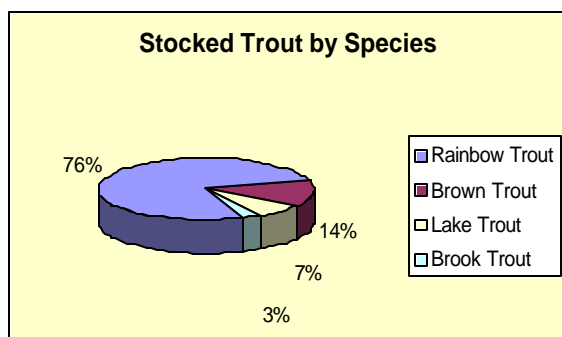
Buffalo Springs Hatchery receives eggs from disease-free sources, such as Erwin National Fish Hatchery, incubates the eggs, and rears the fish to various sizes up to 11 inches. Buffalo Springs supplies Erwin State Fish Hatchery with fingerling (5-inch) rainbow trout as their starter fish. Similarly, Buffalo Springs also provides trout to the City of Gatlinburg's hatchery to be grown out and stocked in Gatlinburg streams. The bulk of Buffalo Springs' production supplies trout for hatchery-supported streams, reservoirs and tailwaters in east Tennessee.



Erwin State Hatchery rarely handles eggs; it relies instead on starter fish from Buffalo Springs Hatchery. Most fish reared at Erwin State Hatchery are 10-inch rainbow trout to be stocked in hatchery-supported streams in upper east Tennessee.

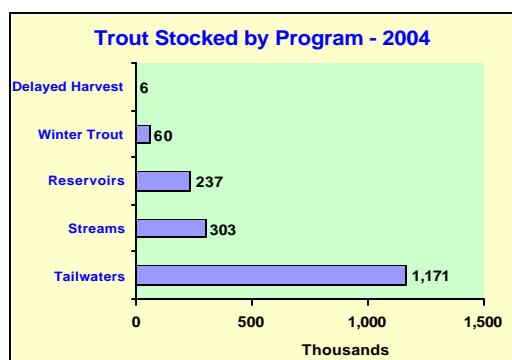
Tellico Hatchery receives 8 to 9 inch rainbow trout from DHNFH. These fish are then grown out to 11-12 inches and stocked frequently into the Tellico River, Citico Creek, Green Cove Pond, and Polk County streams. This intense management requires additional fees to support the program and a special Tellico-Citico permit is required to fish these waters.

Flintville Hatchery was established in 1933 and is Tennessee's oldest trout hatchery. This hatchery grows rainbow trout from eggs to a variety of sizes for the middle Tennessee area. Flintville's trout are primarily stocked in hatchery-supported streams, winter trout areas, and a few tailwaters.



Tennessee relies heavily on trout from DHNFH to support fisheries in tailwaters and reservoirs, and to supply trout to Tellico Hatchery. DHNFH produced 230,000 pounds of trout (1.2 million fish) in 2004 to mitigate for fisheries that were permanently lost due to the construction and operation of dams. Nearly all brown trout stocked in Tennessee are from DHNFH and its production of brown trout is currently at capacity.

Hatcheries are currently operated at capacity and total production is 150,000 pounds short of what TWRA desires for managing its various stocking programs at optimum levels. An independent evaluation of TWRA's trout hatchery system in 2004 determined that TWRA's hatcheries will require much work to maintain existing production and identified options to increase production (FISHPRO 2004). One major issue was the aged infrastructure at Flintville Hatchery, where required maintenance includes replacing spring collection pipes, water lines, and raceways at an estimated cost of \$4.4 million. The evaluation also found that hatchery production could be increased by adding liquid oxygen aeration devices at Buffalo Springs, Erwin State, and Flintville hatcheries at a cost of



\$600,000. TWRA would like to meet future needs by upgrading existing hatcheries and building a new hatchery. A new hatchery would cost about \$12 million. Assuming funding is available, repairs and construction of a new hatchery will take several years to complete. This management plan will identify uses for additional trout, but will not rely on new construction to solve existing trout supply limitations.

TWRA hatcheries currently employ 14 full-time employees. Hatchery staff are responsible for the production and delivery of trout according to the schedule developed by the management team. Hatchery staff also serve a major role in educating the public about the trout program and other TWRA programs. Over 60,000 people visit TWRA hatcheries each year.

*The following mission statement, goals, objectives and strategies were developed by TWRA staff and generally reflect the Agency's current management of trout in Tennessee. This is the part of the plan that needs your review.*

## **Mission Statement**

***"Provide a variety of quality trout angling opportunities that are compatible with Tennessee's other aquatic resources."***

## **Management Goals**

### **GOAL 1. Conserve Tennessee's native, southern Appalachian brook trout.**

**Objective:** Maintain Tennessee's current southern Appalachian brook trout resource at approximately 80 miles distributed among 57 streams, and expand where appropriate.

**Problems:** Brook trout represent only one fourth of Tennessee's wild trout resources and native, southern Appalachian brook trout make up only half of the brook trout resource. These ecologically and recreationally important fisheries face a number of threats, including habitat degradation, non-native species, and loss of genetic integrity through improper stocking practices.

#### **Strategies:**

1. Endorse and implement the management actions and guidelines recommended by the American Fisheries Society's Southern Division Trout Committee in its position statement on managing southern Appalachian brook trout (SDAFSTC 2005). This document addresses issues important to the conservation of southern Appalachian brook trout, including habitat protection and improvement, taxonomic status, hatchery brook trout stocking by TWRA and private landowners, and population restoration and enhancement.
2. Cooperate with the Eastern Brook Trout Initiative. This is a multi-agency effort to assess the current status of wild brook trout populations and develop a comprehensive conservation strategy across the entire range of brook trout in the eastern United States (Maine to Georgia).
3. Promote the importance of native, southern Appalachian brook trout by featuring them in various Agency displays (e.g., at fishing and outdoor shows), publications (e.g. the forthcoming wild trout map), and presentations. TWRA recently cooperated with the Tennessee Aquarium in its efforts to feature native fishes at its facility in Chattanooga. Nearly 100 southern Appalachian brook trout were collected from Carter County streams

and these fish are now on display, and will be accompanied by descriptions of their status and importance.

## **GOAL 2. Protect all wild trout waters from habitat degradation.**

**Objective:** Lose no wild trout populations to habitat degradation and limit impacts on wild trout where some habitat degradation is unavoidable.

**Problems:** Land use changes, water withdrawals such as those affecting Doe Creek, road construction, and other development-related activities threaten or have already impacted wild trout habitat.

### **Strategies:**

1. Verify compliance with Clean Water Act (Section 404) dredge and fill permits and Aquatic Resource Alteration Permits where wild trout habitat is potentially affected.
2. Promote the use of Best Management Practices (BMPs) and Farm Bill projects in watersheds where soil-disturbing activities may impact wild trout habitat.
3. Ensure that all waters actually supporting wild trout are subject to Tennessee Department of Environment and Conservation water quality standards and usage classifications designed to protect wild trout (TDEC 2004).

## **GOAL 3. Integrate trout management with protection of native aquatic ecosystems.**

**Objectives:** Minimize potential impacts of trout stocking on native aquatic ecosystems.

**Problems:** The introduction of exotic species, such as rainbow or brown trout, could have irreversible negative effects on existing aquatic fauna in some locations. There is also some risk of introducing an exotic parasite, bacteria, or other pathogen at every stocking event. TWRA routinely receives recommendations for new trout stocking locations. Additionally, many landowners seek permission to stock their own streams with purchased trout, and some illegally stock their streams. Private trout stocking without TWRA's oversight eliminates the Agency's ability to assure that fish are disease free and are appropriate for that particular body of water.

### **Strategies:**

1. Thoroughly evaluate candidate locations to determine the effects of stocking on native fauna. Consult with USFWS in cases where federally listed species are present.
2. Stocking of hatchery trout should only occur at locations where the expected benefit to anglers is substantially high and potential impacts from introducing exotic species is extremely low.
3. Ensure that any fish purchased from private hatcheries are certified to be free of potentially problematic diseases.



4. Limit introductions of trout to locations where their survival is controlled by summer water temperatures. Likewise, do not stock trout in new locations from which they are likely to enter areas where reproduction could occur and permanent populations could be established.
5. Minimize the risk of establishing new populations in coldwater streams by stocking sterile trout.
6. Enforce and advertise existing laws that prohibit the stocking of streams by anyone other than TWRA, unless permission is granted by the Executive Director of TWRA.

#### **GOAL 4. Maintain a variety of trout fisheries.**

**Objective:** Provide a variety of trout fishing opportunities that satisfy a diverse public's many definitions of quality.

**Problem:** The diversity of trout anglers and the variety of habitats that can support trout fisheries in Tennessee require TWRA to provide a variety of options to satisfy all anglers. However, management that optimizes fisheries for one group may exclude other groups.

##### **Strategies:**

1. Maintain a variety of fisheries for the angling public including wild trout streams, tailwaters, reservoirs, hatchery-supported streams, the winter trout program, and delayed harvest areas.
2. Expand the delayed harvest and winter trout programs.
3. Keep regulations designed to diversify angling experiences, such as Cherokee National Forest wild trout regulations and tailwater quality zones.
4. Continue evaluation of brook trout in the Wilbur tailwater and consider other tailwaters if a brook trout fishery becomes established.
5. Conduct opinions surveys periodically to make sure TWRA's management and trout angler preferences align as much as possible.

#### **GOAL 5. Increase access to trout fisheries.**

**Objective:** Increase access to trout fisheries in tailwaters and hatchery-supported streams at 20 locations during the next 10 years.

**Problems:** Although all streams are public waters, the bottom of a stream is private property in Tennessee. Access is limited to most of our trout fisheries because of the lack of public ownership.

**Strategies:**

1. Purchase property on trout tailwaters that will provide strategic access points for float and wade fishing.
2. Purchase land along streams, then sell unwanted portions of these tracts to generate funds for purchasing access areas on other streams.
3. Request legislative action to create laws that would allow recreational access to the river channel for fishing and travel by boat.

**GOAL 6. Effectively communicate with all trout anglers.**

**Objective:** Keep anglers informed on trout management issues and keep managers aware of angler concerns. Avenues of communication must be available to all anglers.

**Problems:** TWRA has a limited number of media outlets to share information and get feedback from anglers. Furthermore, it is very difficult to gauge opinions or determine a consensus among trout anglers because they represent several distinct groups. Some anglers are not willing to participate in public meetings designed to gather public input, yet they often become active after management decisions are made that negatively affect them. This makes it very challenging for TWRA to get input from the public prior to making management recommendations. Often the only groups that provide input or share opinions represent extreme viewpoints.

**Strategies:**

1. Develop regional focus groups that could be used to gauge interest in or support for various management options.
2. Conduct local public meetings to discuss trout management.
3. Encourage anglers to review the trout management plan.
4. Encourage anglers to review existing management plans for tailwater fisheries, and host a local public meeting to discuss updates to plans.
5. Continue collecting angler preference and satisfaction data via telephone.
6. Continue to welcome calls and emails submitted to TWRA.

**GOAL 7. Optimize use of hatchery trout.**

**Objective:** Ensure that all hatchery trout are used efficiently within the designated program.

**Problems:** The available supply of hatchery trout is limited, and many waters are being stocked at traditional rates that have not been rigorously evaluated. Some fisheries inherently require more trout than others, but there may be opportunities to reduce the number of trout stocked without impacting angler benefits.

## Strategies

1. Wild trout management should be emphasized where feasible. Where hatchery fish are used in wild trout streams, the current scope and scale of stocking should not be expanded. Hatchery fish are most effectively used to provide trout fisheries where wild populations cannot be maintained. Where wild trout populations prove to be insufficient to support angling pressure, means for improving their abundance (e.g., improving habitat) should be explored before stocking is initiated or expanded. Elimination of brown trout stocking in the South Holston tailwater and conversion to an entirely wild fishery for this species is an example of how this strategy has recently been employed.
2. Avoid excessive stocking rates by determining the minimum number of trout that can be stocked and still provide good fishing. Research is needed on hatchery-supported streams and reservoirs to determine optimum rates.
3. Stock fewer pounds of trout, but use larger (e.g., 12 inch) fish. Stocking fewer (but larger) trout at each location would help decrease demand for hatchery production. Angler catch rates may be reduced, but satisfaction could be maintained if the fish are larger.
4. Select ponds or lakes rather than streams for winter trout program events. Stocking rates for the winter program are high. If stocking occurs the day before a heavy rain event, the resulting high flow can preclude fishing and displace or kill the recently stocked trout. Using ponds or lakes for winter fishing events will reduce the need for excessive numbers of fish and maximize benefits from those that are stocked.
5. Promote new fisheries that use fewer hatchery trout. Delayed harvest areas are examples of fisheries that can be sustained with relatively few hatchery trout.
6. Reduce the current creel limit in hatchery-supported fisheries, especially if larger trout are stocked. For example, a creel of three 12-inch trout would weigh nearly the same as seven 9-inch trout.

## GOAL 8. Produce more trout for hatchery-supported fisheries.

**Objective:** Produce an additional 150,000 pounds of trout annually at TWRA hatcheries

**Problem:** Additional trout are needed to improve some tailwater fisheries, create new hatchery-supported streams and lakes, expand the winter trout program, and develop more kids fishing events.

### Strategies:

1. Maintain existing production at TWRA's trout hatcheries by upgrading the existing infrastructure at hatcheries.
2. Add a liquid oxygen system to existing hatcheries to increase production and product quality.
3. Purchase trout as needed from private sources to supplement TWRA production.

4. Build a new trout hatchery to produce 100,000 pounds of trout annually.

### **GOAL 9. Improve the quality of stocked trout.**

**Objective:** Improve the appearance of all catchable trout stocked and use at least 10-inch fish in selected waters, especially hatchery-supported streams, winter stocking events, delayed harvest areas, and kids fishing derbies.

**Problems:** Trout do not have the opportunity to get larger where growth and survival rates are poor (e.g., in many hatchery-supported streams). Anglers obviously prefer to catch larger trout, thus TWRA should strive to stock fish that are at least 10 inches long. Combining numerous smaller fish with 10-inch trout can detract from an angler's fishing experience as the smaller fish are not appreciated. Another problem is the appearance of stocked fish. While the crowded conditions in hatchery raceways do not permit the production of trout that appear perfect, there are times when hatchery fish can be in exceptionally poor condition (e.g., missing multiple fins). Reducing the number of low quality "finless" trout would be appreciated by the public.

#### **Strategies:**

1. Identify stocking events that require "high quality" trout.
2. Grade fish that are scheduled for events to assure that all fish are at least 10 inches.
3. Don't stock small fish. If some portion of the lot to be stocked is below the 10-inch target length, do not stock the short fish. It would be better to stock fewer fish than scheduled but provide a better product.
4. Fund hatchery improvements such as liquid oxygen systems that would help improve the quality of the stocked trout.
5. Use strains that are known to perform well in hatcheries with respect to overall appearance, such as Kamloops and Shasta.

### **GOAL 10. Improve water quality below dams.**

**Objective:** All dams should meet state water quality standards for dissolved oxygen and provide minimum flows that optimize the existing fisheries.

**Problems:** Poor water quality and flow are limiting the recreational value of fisheries below dams, especially Center Hill and Dale Hollow.

#### **Strategies:**

1. Request that the Tennessee Department of Environment and Conservation strictly enforce water quality standards where tailwater trout fisheries occur.
2. Ask federal representatives to support USACE initiatives to improve dissolved oxygen and minimum flows below Center Hill and Dale Hollow dams.

3. Increase public support for improvements by educating anglers about these issues.

### **GOAL 11. Manage reservoir trout fisheries for large fish.**

**Objective:** Increase the size of trout harvested from reservoir fisheries.

**Problems:** Large reservoirs seem to offer great opportunities to grow large trout, yet Tennessee's reservoir trout fisheries are not typically producing these. Something is limiting the growth or survival of trout stocked in reservoirs, but TWRA does not currently monitor reservoir trout populations to identify bottlenecks in the system. Regulations to reduce harvest seem unnecessary because catch rates for trout on reservoirs are low. Regulations that promote catch-and-release would be ineffective during the summer because survival of trout released into warm surface waters after capture from deeper, cooler waters would be extremely low.

**Strategies:**

1. Evaluate the dynamics of reservoir trout populations and their prey species to determine what is limiting potential for large trout.
2. Determine which reservoirs can be managed to produce large trout.
3. Experiment with new strains of brown trout that could be raised to larger sizes prior to the winter stocking season (potentially improving survival).
4. Evaluate new strains of trout that may respond better to reservoir environments.
5. Evaluate current reservoir stocking rates for rainbow trout, brown trout, and lake trout and adjust where necessary. This will improve trout fishing in reservoirs and promote the efficient use of hatchery trout (supporting GOAL 7).

### **GOAL 12. Make it easier to go trout fishing in Tennessee.**

**Objective:** Provide anglers with the information needed to have safe, legal, and satisfactory trout fishing trips.

**Problems:** Anglers want to know as much as possible about a location before committing the resources to go fishing. Many new residents and non-resident anglers do not know where to go trout fishing. Many anglers are confused about license requirements and regulations. There is a common misconception that you do not need a trout license if you do not intend to harvest trout.

**Strategies:**

1. Maintain an up-to-date TWRA website containing maps of the hatchery-supported streams and winter trout program events.
2. Add tailwater access points to the trout website
3. Complete a wild trout fishing map and make it available on the website.



4. Develop and post signs identifying stocked streams. For example, the sign might read “stocked trout stream, fishing permitted, laws will be enforced”.
5. Clarify trout fishing regulations where necessary. Also make it clear to anglers and license agents that anyone who fishes for trout is required to have the appropriate licenses.

### **GOAL 13. Expand trout fishing opportunities for children.**

**Objective:** Continue to provide trout for kids fishing derbies and develop new events that target young anglers (particularly urban kids).

**Opportunity/Problem:** A kid’s fishing derby is a great opportunity to introduce children to fishing. Due to high participation rates at these events, trout are typically used efficiently. However, like other programs, kid’s fishing events are limited by trout availability.

#### **Strategies:**

1. All trout provided for kids fishing events should be at least 10 inches in length to maintain a quality fishing experience.
2. Event organizers should notify TWRA a year in advance to plan trout allocation.
3. Create new youth fishing events using existing fisheries in selected hatchery-supported streams or at winter trout program events by setting aside the first few days after stocking for kids only. This would be similar to TWRA-managed juvenile deer hunts.

### **GOAL 14. Develop more trout fisheries in middle Tennessee.**

**Objective:** Develop at least three new hatchery-supported trout fisheries in middle Tennessee over the next 10 years.

**Problems:** Many of the traditional hatchery-supported fisheries in middle Tennessee have been lost during the last two decades because of reduced public access. Each time land is sold the existing access is at risk. During this period, the population of middle Tennessee has grown substantially and many of the new residents are trout anglers from other states. Another problem is that despite the high demand for stocked trout, a few hatchery-supported streams are under-utilized because of concerns about access and a perception that the stream is always “fished out”.

#### **Strategies:**

1. Work with landowners on existing hatchery-supported streams to keep these areas open to the public. Inform landowners of laws exempting them from liability.

2. Make access a primary consideration for new fisheries. Streams with municipal greenways are likely candidates.
3. Do not use streams that already provide substantial fisheries for other species. Unlike natural fisheries, hatchery-supported streams receive high levels of use over short periods of time. Such fishing pressure could strain existing relations between landowners and anglers, causing anglers to lose access to waters they were formerly allowed to fish year-round.
4. Promote under-utilized fisheries in middle Tennessee by announcing stocking dates in press releases and asking landowners to post “fishing permitted signs”. Evaluate the fishery to determine if use is adequate to warrant continued stocking. If not, discontinue stocking in accordance with GOAL 5.

#### **GOAL 15. Be prepared to meet Tennessee’s future trout management challenges.**

**Objective:** Maintain a comprehensive trout management plan that is capable of addressing contemporary needs.

**Opportunity/Problem:** Changing trout angler preferences and attitudes, along with new challenges and resource management issues, will require that management goals, objectives, and strategies be periodically re-evaluated and adjusted.

**Strategies:**

1. In conjunction with public involvement, update Tennessee’s trout management plan at least every 10 years to ensure that it continues to provide the guidance necessary for wisely managing Tennessee’s trout fisheries.

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